United States
Department of
Agriculture

Soil
Conservation
Service

Cooperating
Agencies

24500

FLOOD PLAIN MANAGEMENT

A STUDY OF BRIERY BRANCH including a portion of NORTH RIVER and MOSSY CREEK

September 1984

ERRATA

Table of Contents - Kenilworth Aquatic Gardens is misspelled.

Page 12 - Photo labeled Saucer Magnolia, SHOULD READ
Southern Magnolia Magnolia grandiflora Southeastern United States.

Photo labeled Southern Magnolia, SHOULD READ
Saucer Magnolia Magnolia x soulangeana Asian Hybrid.

Page 58 - The eighth line of the section on the National Zoo SHOULD READ
dawn redwood instead of bald-cypress.

Page 262 - The Arakawa River is misspelled.

FOREWORD

The Soil Conservation Service, U.S. Department of Agriculture, prepared the information in this flood plain management report. Officials of the Virginia State Water Control Board, the Shenandoah Valley Soil and Water Conservation District, and Rockingham County cooperated in compiling the report. Rockingham County funds covered the cost of printing and finishing the report.

The flood hazard and land use information should serve as a technical base for flood plain management programs. State and local governments, as well as the public, will benefit from knowledge of flood information on Briery Branch, North River and Mossy Creek. A program to minimize future flood damages can be developed from this information. Describing the legal aspects and methods of conducting management programs is not within the scope of this report. However, some general recommendations are included.

We thank the many people who contributed information for the study. We also thank the landowners who gave permission for field surveys.

TABLE OF CONTENTS

FLOOD PLAIN MANAGEMENT

A Study of Briery Branch
and a portion of North River and Mossy Creek
Rockingham County, Virginia

INTRODUCTION

The purpose of the flood plain management study is to define the flood plain and identify potential flood losses. The report serves as the basis to develop a flood plain management program for Briery Branch, a portion of North River and Mossy Creek. Use of this information and compliance with regulations pertaining to flood plain use can minimize loss of life and property damage from future floods. Section 1315.6 of the Virginia Uniform Statewide Building Code sets certain requirements for construction in flood plains. (Ref. 1).

Involved Organizations and Responsibilities

The Shenandoah Valley Soil and Water Conservation District (District) and the Rockingham County Board of Supervisors (County) applied for a flood plain management study of Briery Branch. The State Water Control Board (Board) received the application and requested the Soil Conservation Service (SCS) to conduct this study. SCS prepared a plan of study describing the study area, location, scope, responsibilities, estimated costs, funding arrangements, and tentative schedules. This plan of study approved on February 4, 1982 was reviewed by the District, County and Board. The Plan of Study included Briery Branch and a portion of North River. Later an Amendment was prepared and approved April 27, 1983 to add Mossy Creek to the study. Mossy Creek is a tributary to North River.

SCS had responsibility for implementing the technical phases of the study, preparing maps and drawings and printing portions of the report. The County provided available information on the study area and obtained permission for field surveys. The County also paid all expenses in connection with printing and finishing. The County and District will hold public meetings and provide necessary publicity to implement a flood plain management program. The Board and SCS will provide assistance to assure prompt and effective use of the study findings.

Authorities

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture participated in this study under the following authorities:

-- Section 6, Public Law 83-566, as amended;

-- Federal level Recommendation 3, A Unified National Program for Flood Plain Management, Water Resources Council, September 1979;

-- Executive Order 11988, January 25, 1978;

-- U.S. Department of Agriculture Secretary's Memorandum 1606 and 1607, November 7, 1966.

State statutes and directives of the Governor of Virginia authorize Board, District, and County involvement in flood plain management surveys and related studies. This study was performed in accordance with a Joint Coordination Agreement for Flood Plain Management between the State Water Control Board and the Soil Conservation Service, dated January 1979.

DESCRIPTION OF STUDY AREA

Upstream Drainage Area

The study area comprises 179.24 square miles. Over half of the drainage area is in neighboring Augusta County (Figure 1). North River is a subbasin of the Potomac River Basin which is in Mid-Atlantic Region as designated by the Water Resources Council. The USGS Hydrologic Unit code number in the area is 02070005.

The watershed is in the Northern Applachian Ridges and Valleys physiographic province. Soils are formed primarily in Alluvial or Colluvial material. Monongahela and Craigsville along with miscellaneous - Typic Udorthents are the predominant soils. 1/

Land use is about 12 percent pasture and hay, 80 percent woodland, and 8 percent cropland and miscellaneous. Woodland in upper reaches is in the Federally owned George Washington National Forest.

Normal annual precipitation is 40 inches, including 25 inches of snowfall which equals about 2 inches of rainfall. Average January temperature is 35 degrees F and the average for July is 74 degrees F. Average growing season is 160 days.

1/ Soil Survey data is available at the SCS Rockingham County Field Office, Harrisonburg, Virginia.

VICINITY MAP

BRIERY BRANCH, NORTH RIVER & MOSSY CREEK

ROCKINGHAM COUNTY
VIRGINIA

0' 4000' 8000' 12000' 16000'

BASE SOURCE: U.S.G.S. 1:24,000 TOPO SHEET

LEGEND

Study Stream

Flood Plains

State Route 729 parallels North River through the study area. Other roads such as 750, 755, 613, 752, and 748 cross the Briery Branch flood plain. The predominate land use in this flood plain is cropland and idle land with heavy shrub and tree growth along the stream. In addition, land use in these flood plains consists of pasture, medium and light brush, and meadow. Roads, barns, poultry houses, trailers, and dwellings take up a small percentage of land.

A total of approximately 15.9 stream miles were studied. This included 2.0 miles along Mossy Creek; 6.7 miles of North River; and 7.2 miles of Briery Branch (see Figure 1).

Natural and Beneficial Values

North River, the lower section of Briery Branch and Mossy Creek are classified as mountainous zone, cool cobbly-boulder substrate streams characterized by wide flood plains, moderate slopes and rapid runoff of floodwaters. Briery Branch, above its confluence with Beaver Creek, is often dry. Large springs are present in these streams and in adjacent tributaries, especially in the lower sections of the study area. Mossy Creek, in fact, is primarily spring fed.

North River and the lower portion of Briery Branch are smallmouth and rock bass streams. However, they do contain localized sections of cold water where the springs occur. In these areas some escaped stocked trout (mostly from Mossy Creek) flourish and reproduce. Mossy Creek is a trophy brown trout fishery and is considered one of the best trout streams in the region. Recreation use and value is high in Mossy Creek and low to moderate in the remaining stream sections.

FLOOD HISTORY

The most damaging flood of record occurred in June 1949. In 1950 it was reported that damages exceeded $2,000,000 along with three deaths in the Town of Bridgewater. (Ref. 2). Damages included property loss (homes, furniture and livestock), farm loss (crops, fences, and land), road and highway damage, Rural Electrification Administration (distribution lines and telephone lines) damages, and damages in Bridgewater. Bulletin 10 (Ref. 2) in 1950 projected the 1949 flood to be about a 75-year flood. Data published by U.S. Geological Survey in 1978 show that the 1949 storm at the North River gage near Stokesville would exceed the 100-year event. (Ref. 5). Many other storms have occurred but none as large as the 1949 flood.

FLOOD POTENTIAL

Present Conditions

Large Floods. Extreme floods would inundate about 1800 acres of primarily agricultural land (see table below). Extensive damage would be done to the land, crops, fences, farm roads, dwellings, buildings, and machinery. Damage to dwellings and businesses would occur mostly along the main stream of North River. Velocities would average about 3.5 feet per second and exceed 4.5 feet per second in some reaches. Out-of-bank stages would average about 2.6 feet for the 100-year storm to 3.4 feet for the 500-year storm. Duration of flooding would seldom exceed 20 hours except during storms of prolonged rainfall.

In a situation of varying rainfall patterns a large rain could occur below the existing dams. (Ref. 3 & 4). In this case no protection would be given by the dams. (See section on Existing Programs for further explanation of the dams).

Flood Hazard Areas. The acres tabulated below are used primarily for pasture and other agricultural uses. Only about two percent is devoted to roads, farmsteads, and similar uses.

	(Acres by Flood Frequency)		(Buildings in 100-year Flood Plain)				
Stream	100-year	500-year	Dwellings	Barns	Trailers	Stores	Misc.
North River	901	978	6	4	1	0	9
Briery Branch	707	954	14	3	3	1	9
Mossy Creek	220	234	1	1			
Totals	1,828	2,166	21	8	4	1	18

PHOTOGRAPHS OF POTENTIAL FLOOD STAGES

Figure 2. State Route 755 crossing Briery Branch northeast of Spring Creek Church. (At cross section BB83)

Figure 3. State Route 752 crossing Briery Branch west of Beaver Creek Church. (At cross section BB94)

Figure 4. Mossy Creek looking across State Route 747 near junction with State Route 835. (At cross section MC94)

Flood Plain Management Exhibits. The technical data needed for establishing a flood plain management program is in the appendix. Also the appendix outlines a procedure for determining the flood elevations at any particular location.

Flood plain photomaps show the area covered by the 100- and 500-year floods. Where only one line is shown, there is no difference in the boundary of the two flood areas. These photomaps should be used to determine approximate flood elevations.

Flood profile plates provide elevations of the 100- and 500-year floods at any location along the length of the streams. The elevations and discharges of the 10-, 25-, 50-, 100- and 500-year flood at each surveyed cross section are given in Table A-1. Sample cross sections illustrate how the flood areas were located on the photomaps.

Also included in the appendix is a list of benchmark elevations and locations, a glossary of terms and a list of references. The basic data is on file in the office of the USDA, Soil Conservation Service, 400 North Eighth Street, Federal Building, Richmond, Virginia 23240.

Limitations on Use of Data. The flood elevations given in this report should be considered as minimum elevations. During floods, uprooted trees and other debris may collect on bridges and culverts and clog the channels. Such obstructions increase the depth and extent of flooding. The analysis was made without showing the effects of potential obstructions. Also, extremely rare events such as dam failure and climatic changes were not analyzed.

Future Conditions

The hydrologic conditions in the upstream areas are expected to improve as foresters and others continue to apply good management and conservation practices. This improvement is expected to reduce runoff approximately to the extent that additional development will increase runoff. Therefore, the flood hazard and damage potential is not expected to change significantly in the next 10 to 15 years.

FLOOD PLAIN MANAGEMENT

Existing Programs

In 1960 the Upper North River Public Law-534 (PL-534) Work Plan was prepared by the Shenandoah Valley Soil Conservation District. (Ref. 3) Measures within the plan provided land treatment, flood prevention, channel improvement, recreation, and Municipal and Industrial Water Supply. All three dams (sites 10, 76, and 77) proposed in the plan have been installed above this flood plain management study area. Proposed channel work has not been installed. Site 10 is on Skidmore Fork; Site 76 is on North River upstream of the Staunton Dam; and Site 77 is on Little River. All sites are in Augusta County and upstream of the North River portion of the Study Area.

In 1964 the Lower North River PL-534 Work Plan was also prepared by the Shenandoah Valley Soil Conservation District. (Ref. 4) Measures within this plan provided land treatment, flood prevention, channel improvement, and recreation. Five of the proposed 17 dam sites are above the study area. Mossy Creek sites 33 and 57 located in Augusta County have not been built. The other three sites have been installed. Site 80 is on Union Springs Run upstream of Beaver Creek; Site 83 is on Hone Quarry, a tributary to Briery Branch and Site 78 is on Briery Branch. Site 80 is shown on Figure 1. Proposed channel work has not been installed in the study area.

Summary of Completed Structures

Upper North River Watershed

Dam Site #	Name	Class 1/	Total Flood Storage Ac/Ft	Date Construction Completed
10	Todd Lake	B	688	5-13-63
76	Elkhorn Lake	C	7,020	11-5-65
77	Hearthstone	C	2,768	10-28-66
	Lower North River Watershed			
78	Briery	C	1,666	9-20-68
80	Union Springs	C	1,016	6-17-67
83	Hone Quarry	C	1,276	11-1-68

The lower end of the study ties into the Dry River - North River Flood Hazard Analyses completed in 1974. (Ref. 16) The upstream end of the North River portion ties into the Upper North Flood Plain Management Study completed in 1984 for Augusta County. (Ref. 17) Flood Plain data from these two studies are currently being used by Augusta and Rockingham counties.

1/ Hazard class - A, B, or C

Rockingham County has previously enacted the usual ordinances relating to zoning, subdivisions, sanitation utilities and similar developments. None of the ordinances provide specifically for regulation in the use and management of flood prone areas, but to come under the regular Flood Insurance Program will require adoption of such regulations by localities. Also, a commitment to such constraints are now a prerequisite for federal funding under certain national programs.

The 1981 Edition of the Virginia Statewide Building Code (Ref. 1) requires restrictions on new construction and floodproofing of existing structures below the 100-year flood elevation. Data in this report can be used to comply with this section of the code. The bibliography lists several references (8-11) that discuss flood plain regulation and floodproofing measures. Rockingham County has adopted these restrictions.

The Virginia Erosion and Sediment Control Handbook was adopted in 1974 and subsequently recited in 1980. (Ref. 6) The handbook includes mandatory criteria for control of runoff and sediment, and for prompt revegetation of sites disturbed by earth-moving operations.

Rockingham County has participated in the National Flood Insurance Program since 1974 under the emergency program and is working to come under the regular Flood Insurance Program. Participating communities are required to regulate use and development of flood plains. The program is administered by the Federal Emergency Management Agency (FEMA). In those communities participating in the FEMA program, owners and occupiers of all buildings and mobile homes in the community are eligible to obtain subsidized flood insurance coverage.

Floodways

Any construction activity that raises the elevation of the flood plain will restrict flow and increase flood heights. One part of flood plain management is balancing the benefits of flood plain development with the increased flood hazard. The floodway concept divides the 100-year flood area into a floodway and a floodway fringe. The floodway fringe is the portion of the flood plain that can be obstructed without increasing the water-surface elevation of the 100-year flood more than one foot or creating hazardous depths or velocities in the floodway. The floodway is the remaining portion of the channel and the flood plain (Figure 5).

A preliminary analysis was made for a floodway in the study area. Values would exceed the criteria for hazardous conditions 1/. This confirms results of other studies that floodways should not be recommended by SCS on these flood plains.

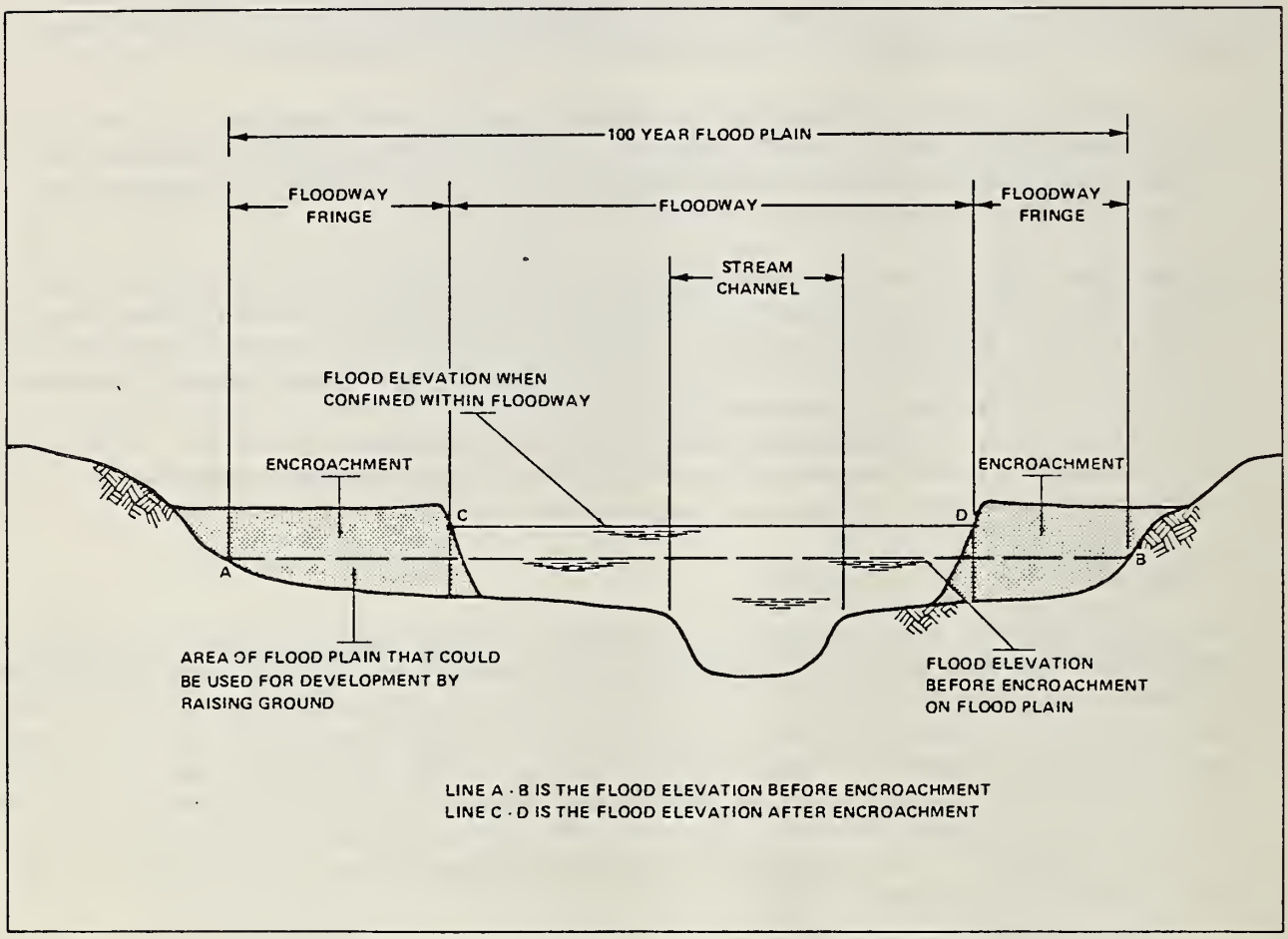

FIGURE 5. FLOODWAY SCHEMATIC

1/ A hazardous condition is considered to exist if: the depth in feet times the velocity in feet per second exceeds seven; or the depth exceeds three feet, or the velocity exceeds 12 feet per second.

Recommendations

It is recommended by this report that local sponsors use the report and other such studies in the county to develop and implement a comprehensive flood plain management program. It is specifically recommended that the sponsors:

--review and update local ordinances relating to flood plains as a sound basis for the program; in particular, include restrictions on use and occupancy of flood plains as required by state legislation;

--carry out public information activities stressing the need for and the community benefits of the program;

--emphasize the importance of proper land use and conservation treatment in reducing flood hazards;

--encourage owners and occupants of buildings and mobile homes within and adjacent to the delineated flood hazard areas to carry flood insurance on the structures and contents;

--determine what assistance is available and implement the restoration of riparian vegetation along the study streams; and

--promote use of floodproofing or other nonstructural measures.

Evaluation of Potential

The recommendations above indicate the potential opportunities to reduce or minimize the impacts of future floods. The primary opportunities have to do with avoiding or regulating occupancy and modification of the flood plains. The Statewide Building Code and the Erosion and Sediment Control Ordinance provide useful tools to implement these opportunities. One prohibits or restricts further development in the flood plain (Ref. 1); the other (Ref. 6) provides for control of runoff and sediment from upstream development which might increase the flood hazard.

Public support can be enhanced through public information activities which stress the specific and community benefits of the flood plain management program. This will also afford the opportunity to emphasize the continuing importance of proper land use and conservation treatment throughout the community.

APPENDIX

This appendix provides the data needed to use this report.

The Flood Plain Area Photomaps can be used for decisions where precise elevations are not required; for example, a brief check of the appropriate photomap may indicate that a proposed building site is obviously in or out of the flood plain.

Following the photomaps are flood profiles and benchmark data. These two exhibits can be used with the photomaps to determine flood elevations at any point along the streams in the study area as follows:

1. On the appropriate photomap find the point on the stream where the proposed building is to be located; then scale the distance along the stream to the nearest cross section.

2. On the appropriate flood profile sheet, scale the distance determined in Step 1 from the cross section back to the original stream location, and read the elevation of the desired flood frequency line.

3. Transfer the elevation determined in Step 2 to the ground from the nearest established benchmark.

   If the point on the ground is at one of the surveyed cross sections, the elevation can be read directly from Table A-1.

Typical cross sections following the profile plates illustrate the procedure used for placing flood elevations on Flood Plain Area Photomaps. The photomaps are based on semicontrolled aerial mosaics and the dimensions of the photomaps are not identical to those on the cross sections.

FLOOD HAZARD STUDY AREA
AND
PHOTO MAP INDEX

BRIERY BRANCH, NORTH RIVER & MOSSY CREEK

ROCKINGHAM COUNTY
VIRGINIA

0' 4000' 8000' 12000' 16000'

BASE SOURCE: U.S.G.S. 1:24,000 TOPO SHEET

LEGEND
Stream Channel
Sheet Coverage

X B.M. 133

STATE ROUTE 257

HONE QUARRY

BRIERY BRANCH

UPPER LIMITS OF STUDY

BB 74

BB 74

7

N

MATCH PHOTO MAP 2

LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH BT AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
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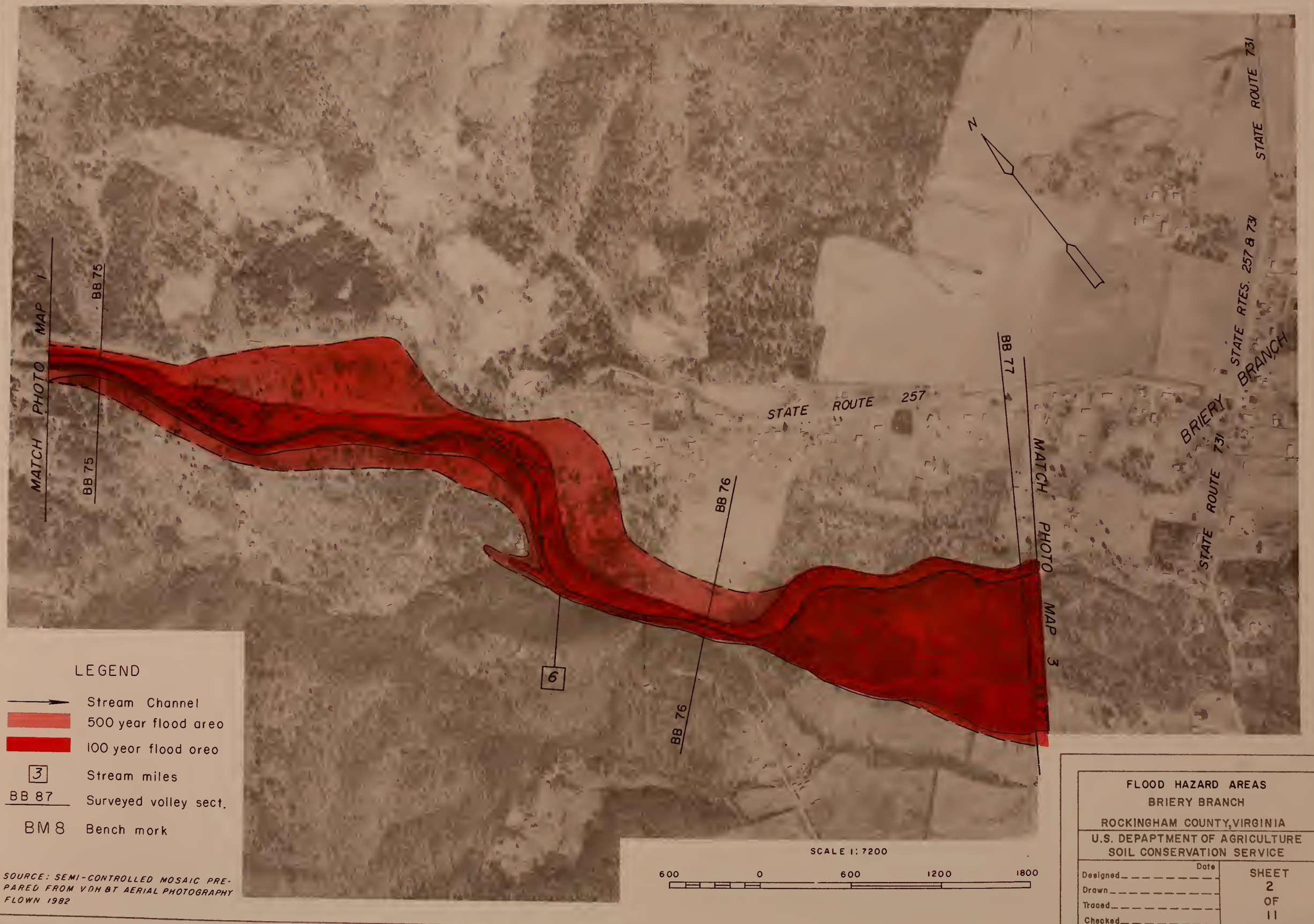

LEGEND

- Stream Channel
- 500 year flood areo
- 100 yeor flood oreo
- [3] Stream miles
- BB 87 Surveyed volley sect.
- BM 8 Bench mork

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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MATCH PHOTO MAP 2

MATCH PHOTO MAP 4

STATE ROUTE 257

BRIERY BRANCH

STATE ROUTE 257 and 731

STATE ROUTE 731

BB 78A

BB 80B

BB 81

3

2

LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

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SOIL CONSERVATION SERVICE

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SHEET 3 OF 11

MATCH PHOTO MAP 3

4

BB 82A

BB 82A

STATE RTE. 755

B.M. 73

BB 84B

BB 84B

BRIERY BRANCH

STATE ROUTE 755

BB 85

BB 85

MATCH PHOTO MAP 5

N

SCALE 1: 7200

600 0 600 1200 1800

LEGEND

Stream Channel

500 year flood area

100 year flood area

3 Stream miles

BB 87 Surveyed valley sect.

BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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SHEET 4 OF 11

MATCH PHOTO MAP 4

MATCH PHOTO MAP 6

BB 86

BB 87

BB 88A

BB 90B

BB 91

B.M. 1001

3

2

Z

STATE ROUTE 871

STATE ROUTE 613

BEAVER CREEK

LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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SHEET 6 OF 11

LEGEND

Stream Channel

500 year flood area

100 year flood area

[3] Stream miles

BB 87 Surveyed valley sect.

BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

MATCH PHOTO MAP 6

MATCH PHOTO MAP 8

MATCH PHOTO MAP 11

1949 FLOOD

BB 100

NR 70

NR 71

NR 72

NR 73

NR 74

STATE ROUTE 727

BM 102

MC 97A

N

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
BRIERY BRANCH
NORTH RIVER & MOSSY CREEK
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
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LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA

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SHEET 8 OF 11

MATCH PHOTO MAP 10

NR 65

NR 66

1949 FLOOD

NR 67A

NR 69B

MATCH PHOTO MAP 6

BELLE GROVE FARM

NORTH RIVER

STATE ROUTE 727

N

LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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SHEET 9 OF 11

LEGEND

Stream Channel

500 year flood area

100 year flood area

[3] Stream miles

BB 87 Surveyed valley sect.

BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH&T AERIAL PHOTOGRAPHY FLOWN 1982

N

NR 63

NR 64

NR 62

1949 FLOOD

BM 2000

UPPER LIMIT OF STUDY

NORTH RIVER

ROCKINGHAM COUNTY

AUGUSTA COUNTY

STATE ROUTE 766

MATCH PHOTO MAP 9

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date
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SHEET 10 OF 11

United States Department of Agriculture

Soil Conservation Service

400 North Eighth Street
Richmond, VA 23240-9999

August 25, 1986

TO: ALL INTERESTED AGENCIES AND ORGANIZATIONS

Enclosed for your information and use is a copy of the recently completed Flood Plain Management Study of Briery Branch including a portion of North River and Mossy Creek of Rockingham County, Virginia. This study was made at the request of the Rockingham County Board of Supervisors and the Shenandoah Valley Soil and Water Conservation District through the State Water Control Board, Bureau of Water Control Management (SWCB). The request was made in accordance with SWCB's January 1979 Joint Coordination Agreement with the Soil Conservation Service.

This study was carried out under the authority of Section 6 of Public Law 83-566, in accordance with Executive Order 11988, and House Document No. 465, 89th Congress, 2nd Session, especially Recommendation 9(c), "Regulation of Land Use." The purpose of the study is to make flood hazard and land use information available to the local government and citizens in order to encourage land use appropriate to the degree of hazard involved.

The Soil Conservation Service's objective in developing this technical data is to help reduce present and potential flood damages through wise use of flood plain lands, thereby improving the health, safety, economy, and environmental conditions of the community.

L A Sutton, Jr
Actg.

GEORGE C. NORRIS
State Conservationist

Enclosure

cc: Gerald P. Bowie, Staff Ldr for Water Resources
Russell Craddock

The Soil Conservation Service is an agency of the United States Department of Agriculture

☆ U.S. Government Printing Office: 1983—420-939/1578

LEGEND

- Stream Channel
- 500 year flood area
- 100 year flood area
- [3] Stream miles
- BB 87 Surveyed valley sect.
- BM 8 Bench mark

SOURCE: SEMI-CONTROLLED MOSAIC PREPARED FROM VDH BT AERIAL PHOTOGRAPHY FLOWN 1982

SCALE 1: 7200

600 0 600 1200 1800

FLOOD HAZARD AREAS
MOSSY CREEK
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPAPTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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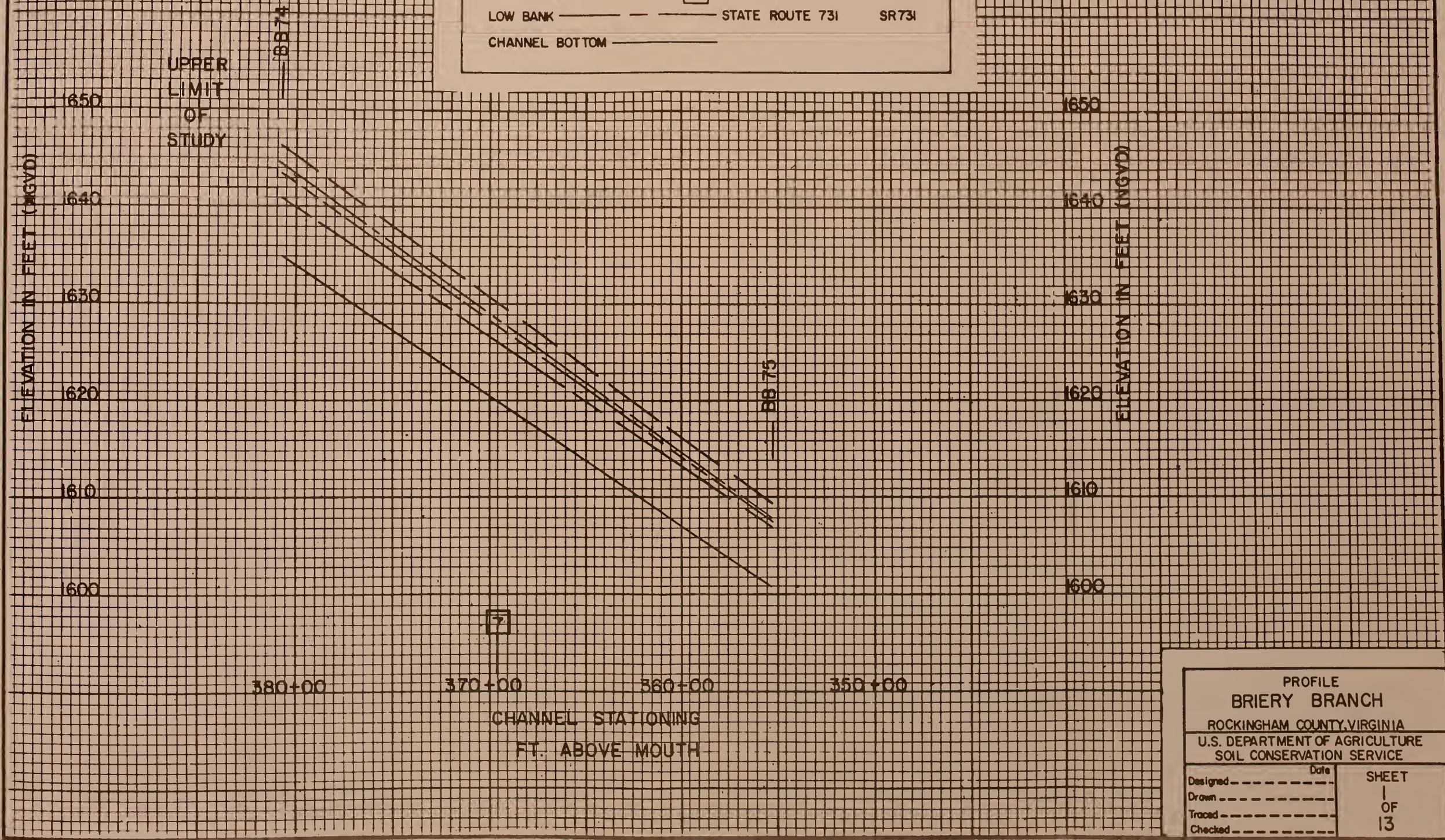
LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	
STREAM MILES 2	ELEV-LOW ROAD	
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		



PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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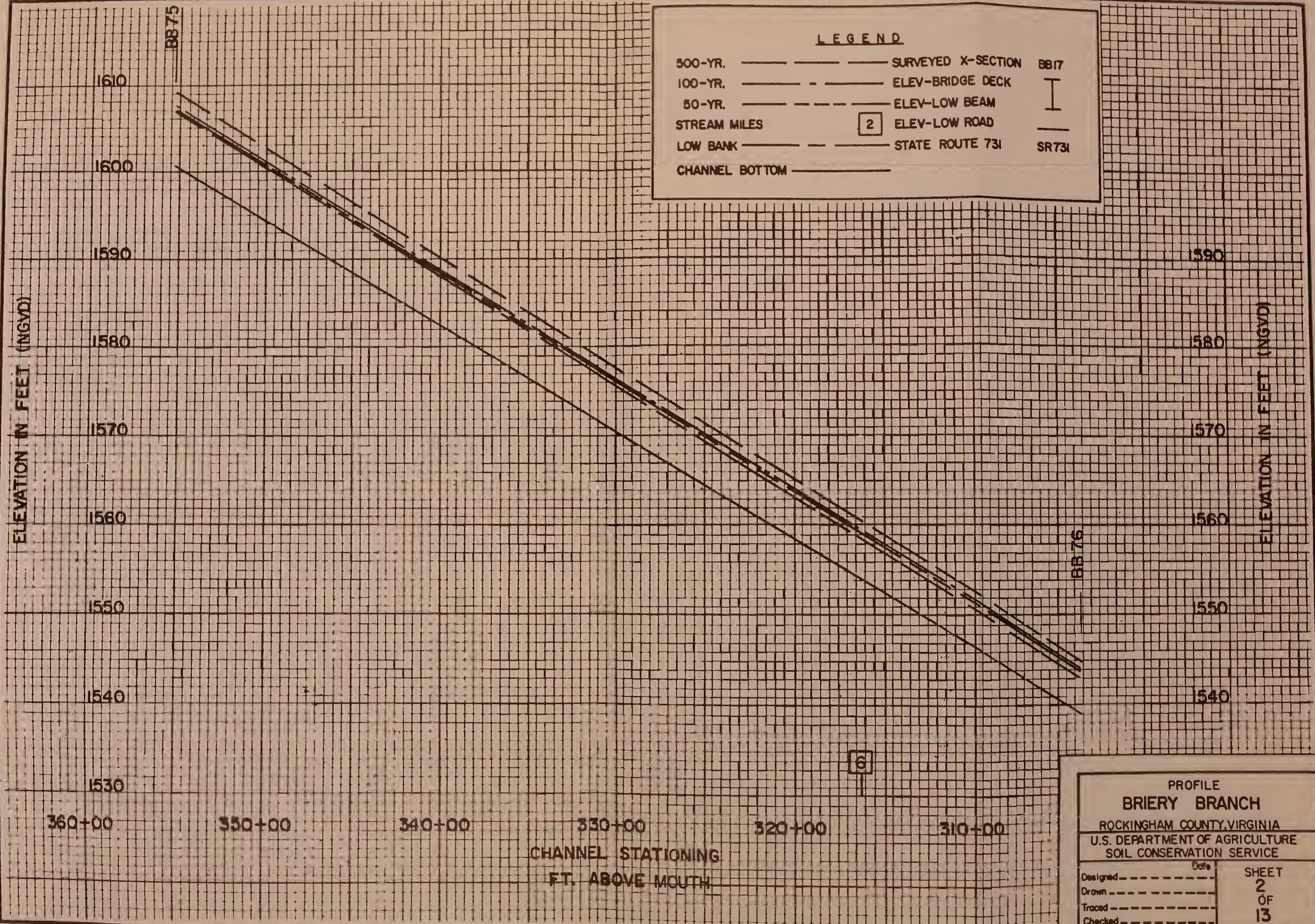
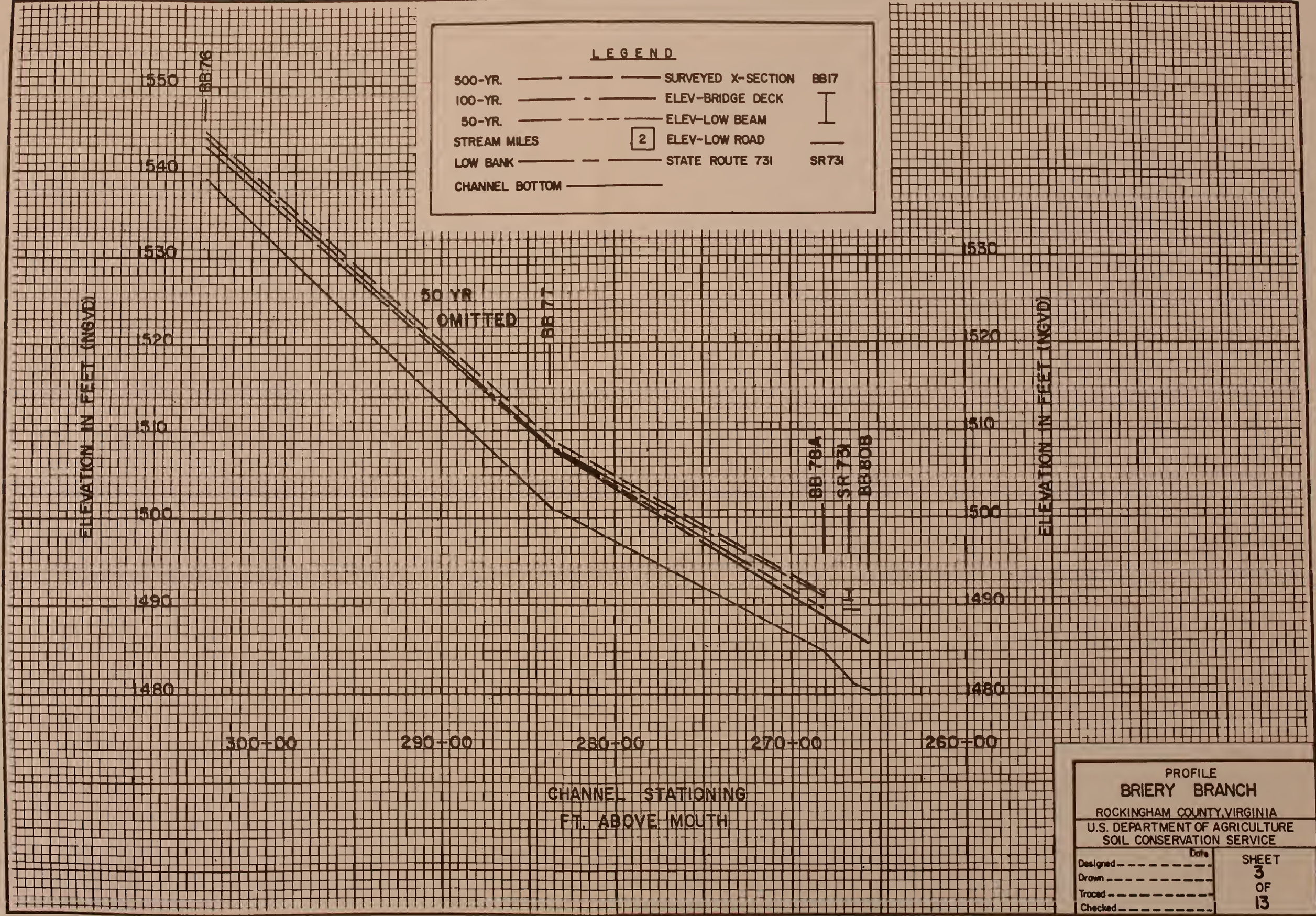
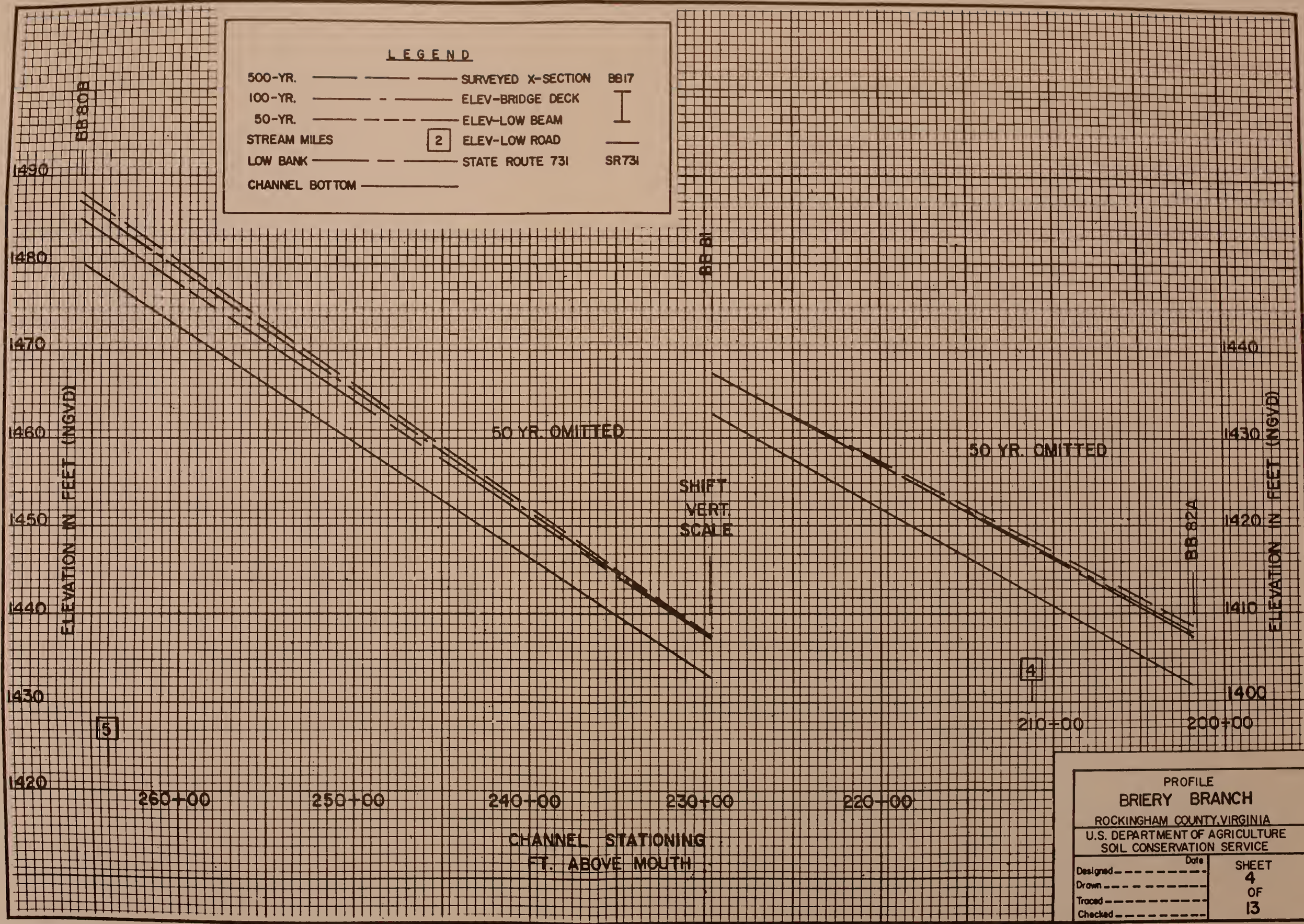
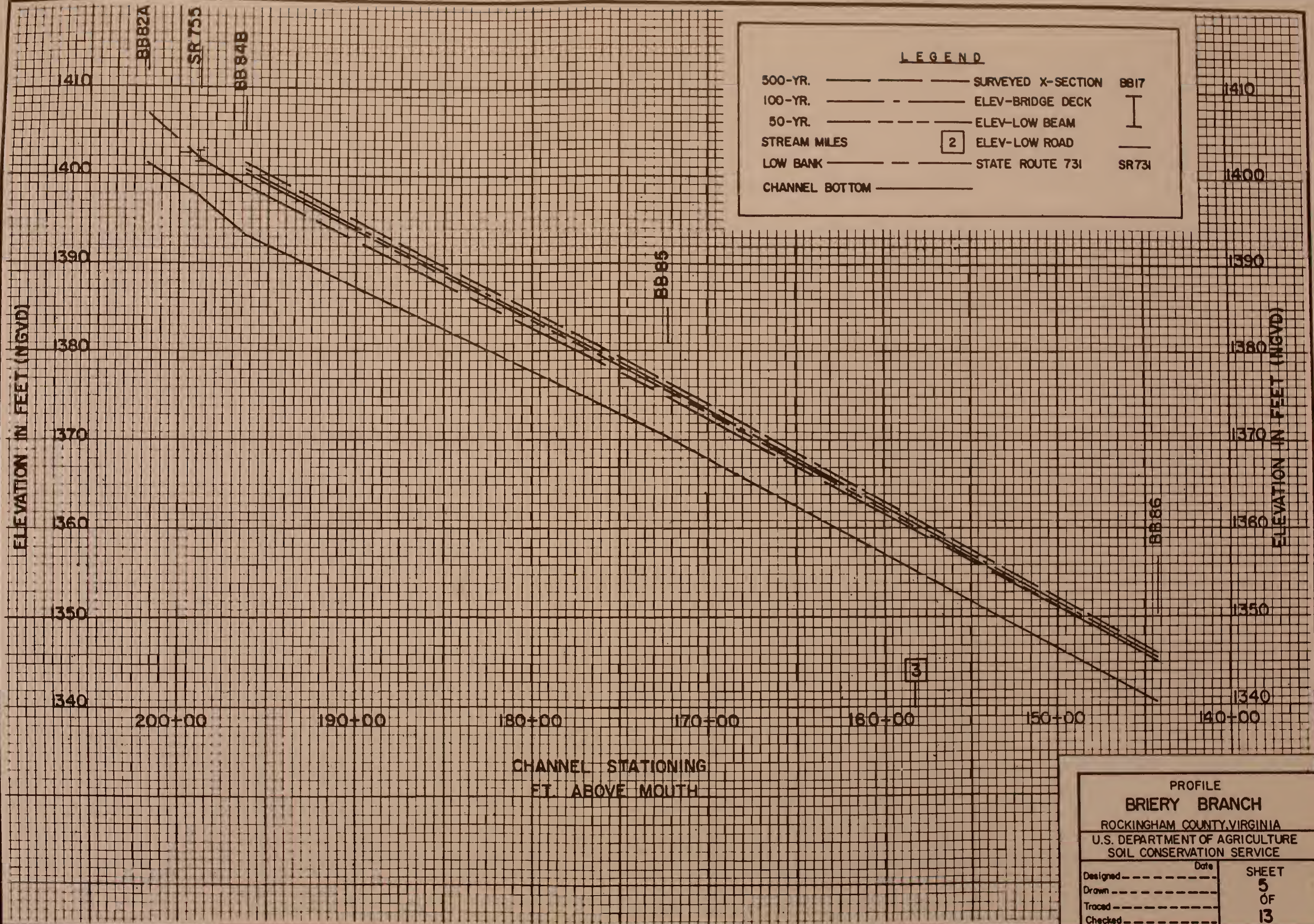


PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	2
Drawn	OF
Traced	13
Checked	


LEGEND
500-YR. SURVEYED X-SECTION BB17
100-YR. ELEV-BRIDGE DECK
50-YR. ELEV-LOW BEAM
STREAM MILES 2 ELEV-LOW ROAD
LOW BANK STATE ROUTE 731 SR731
CHANNEL BOTTOM
550
540
530
520
510
500
490
480
ELEVATION IN FEET (NGVD)
BB 76
50 YR. OMITTED
BB 77
BB 78.4
SR 731
BB 80.8
I-81
300+00
290+00
280+00
270+00
260+00
CHANNEL STATIONING
FT. ABOVE MOUTH
PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
Designed
Drawn
Traced
Checked
SHEET 3 OF 13


LEGEND
500-YR. SURVEYED X-SECTION BB17
100-YR. ELEV-BRIDGE DECK
50-YR. ELEV-LOW BEAM
STREAM MILES 2 ELEV-LOW ROAD
LOW BANK STATE ROUTE 731 SR731
CHANNEL BOTTOM
BB 80B
BB 81
BB 82A
50 YR. OMITTED
50 YR. OMITTED
SHIFT VERT. SCALE
ELEVATION IN FEET (NGVD)
1490
1480
1470
1460
1450
1440
1430
1420
1440
1430
1420
1410
1400
5
4
260+00
250+00
240+00
230+00
220+00
210+00
200+00
CHANNEL STATIONING FT. ABOVE MOUTH
PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
Designed
Drawn
Traced
Checked
SHEET 4 OF 13



PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	5
Drawn	OF
Traced	13
Checked	

LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	I
STREAM MILES	ELEV-LOW ROAD	—
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		

BB 86

BB 87

BB 88A
SR 613
BB 90B

BB 91

50 YEAR
OMITTED

500 YEAR
100 YR & 50 YR.
BELOW BANKFULL

2

ELEVATION IN FEET (NGVD)

1350
1340
1330
1320
1310
1300
1290
1280

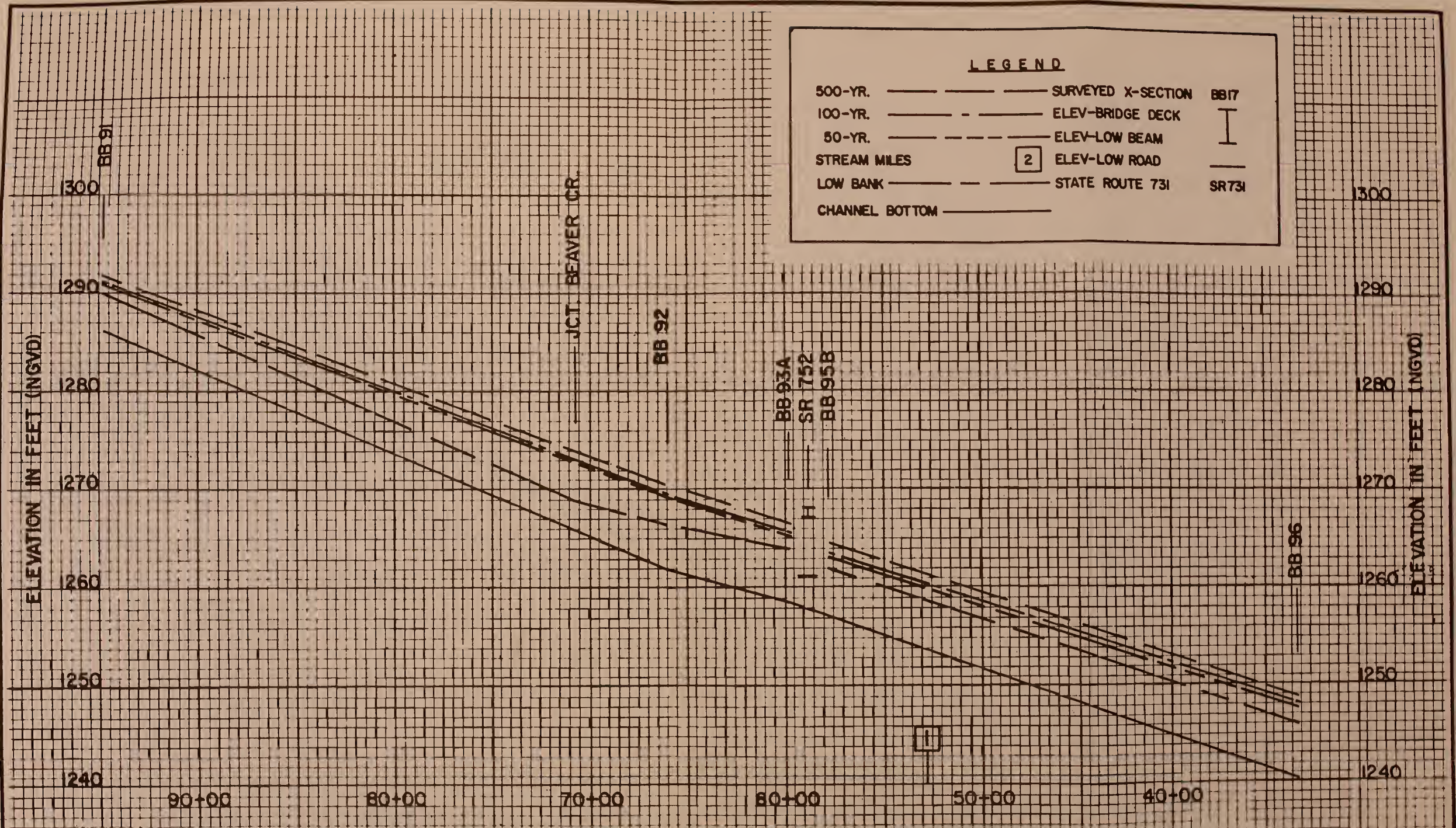
140+00 130+00 120+00 110+00 100+00

CHANNEL STATIONING
FT. ABOVE MOUTH

PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	6
Drawn	OF
Traced	13
Checked	



PROFILE

BRIERY BRANCH

ROCKINGHAM COUNTY, VIRGINIA

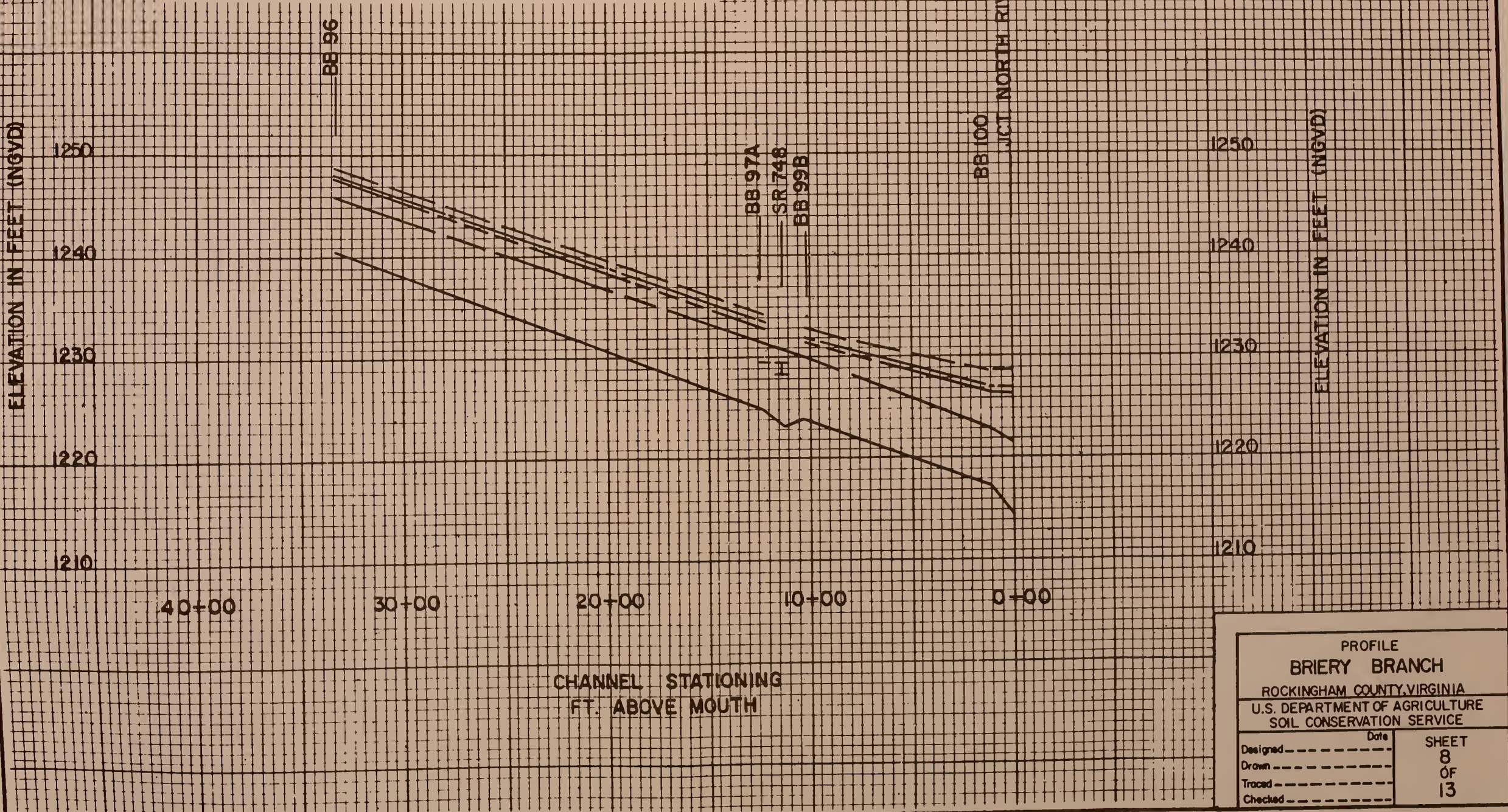
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date
Designed	
Drawn	
Traced	
Checked	

SHEET 7 OF 13

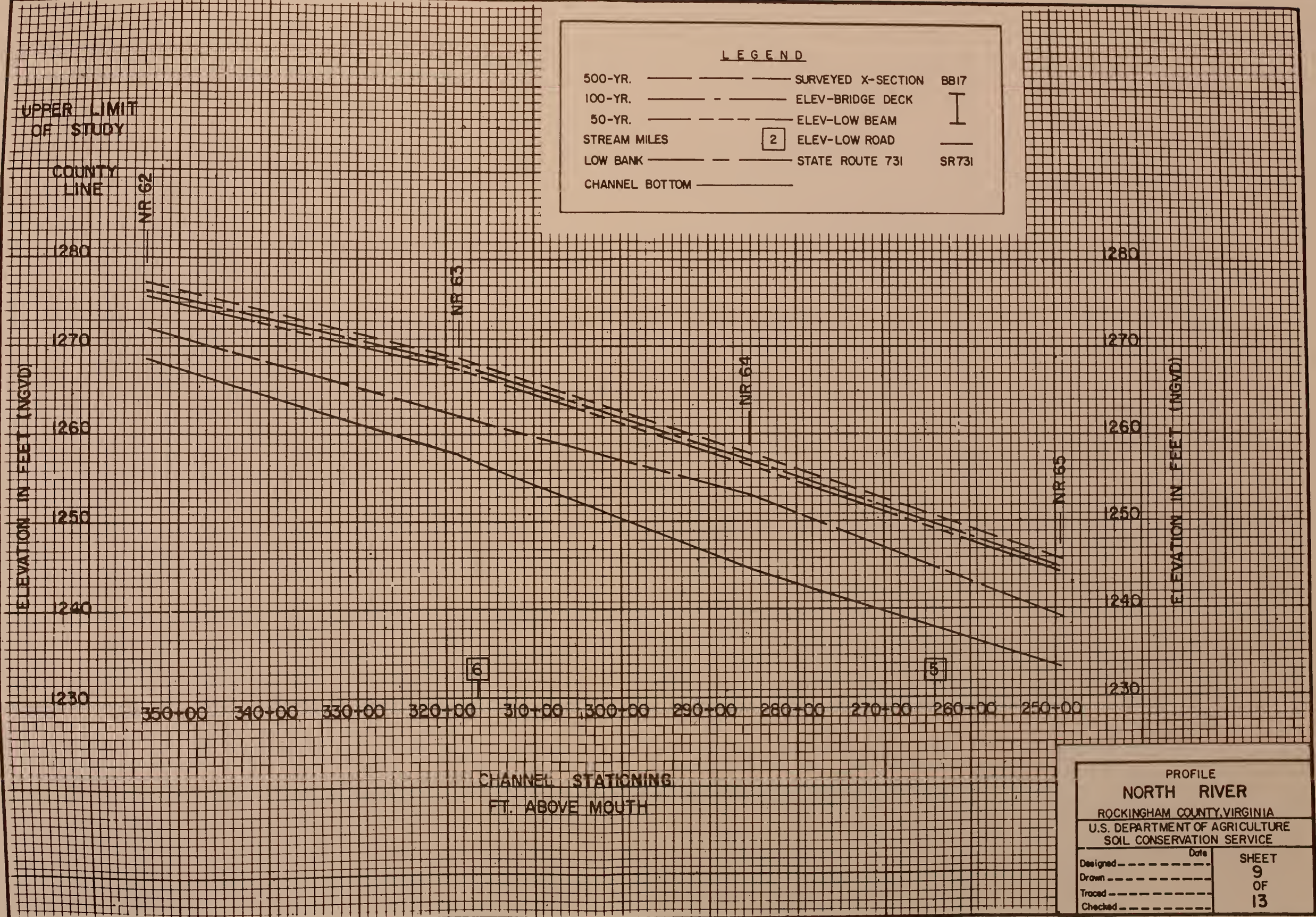
LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	
STREAM MILES 2	ELEV-LOW ROAD	
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		



PROFILE
BRIERY BRANCH
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	8
Drawn	OF
Traced	13
Checked	

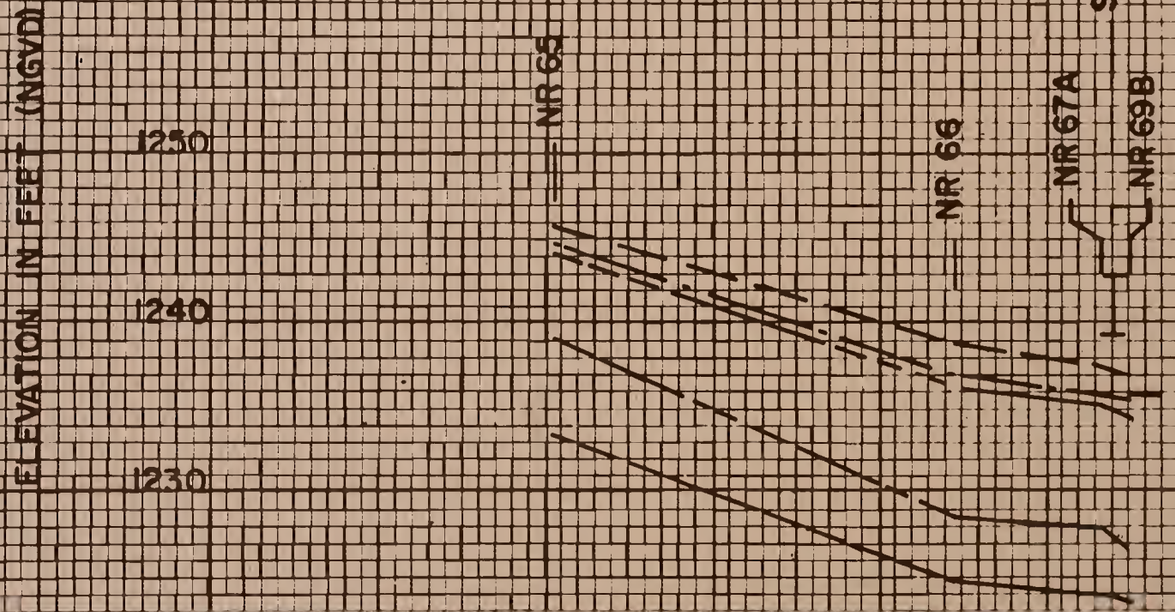


PROFILE
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	9
Drawn	OF
Traced	13
Checked	

LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	I
STREAM MILES 2	ELEV-LOW ROAD	—
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		



PROFILE
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	10
Drawn	OF
Traced	13
Checked	

LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	
STREAM MILES	[2] ELEV-LOW ROAD	—
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		

NR 69B

JCT. BRIERY BRANCH

NR 70

NR 71

NR 72

JCT. MOSSY CREEK

NR 73

NR 74

ELEVATION IN FEET (NGVD)

1240
1230
1220
1210
1200
1190

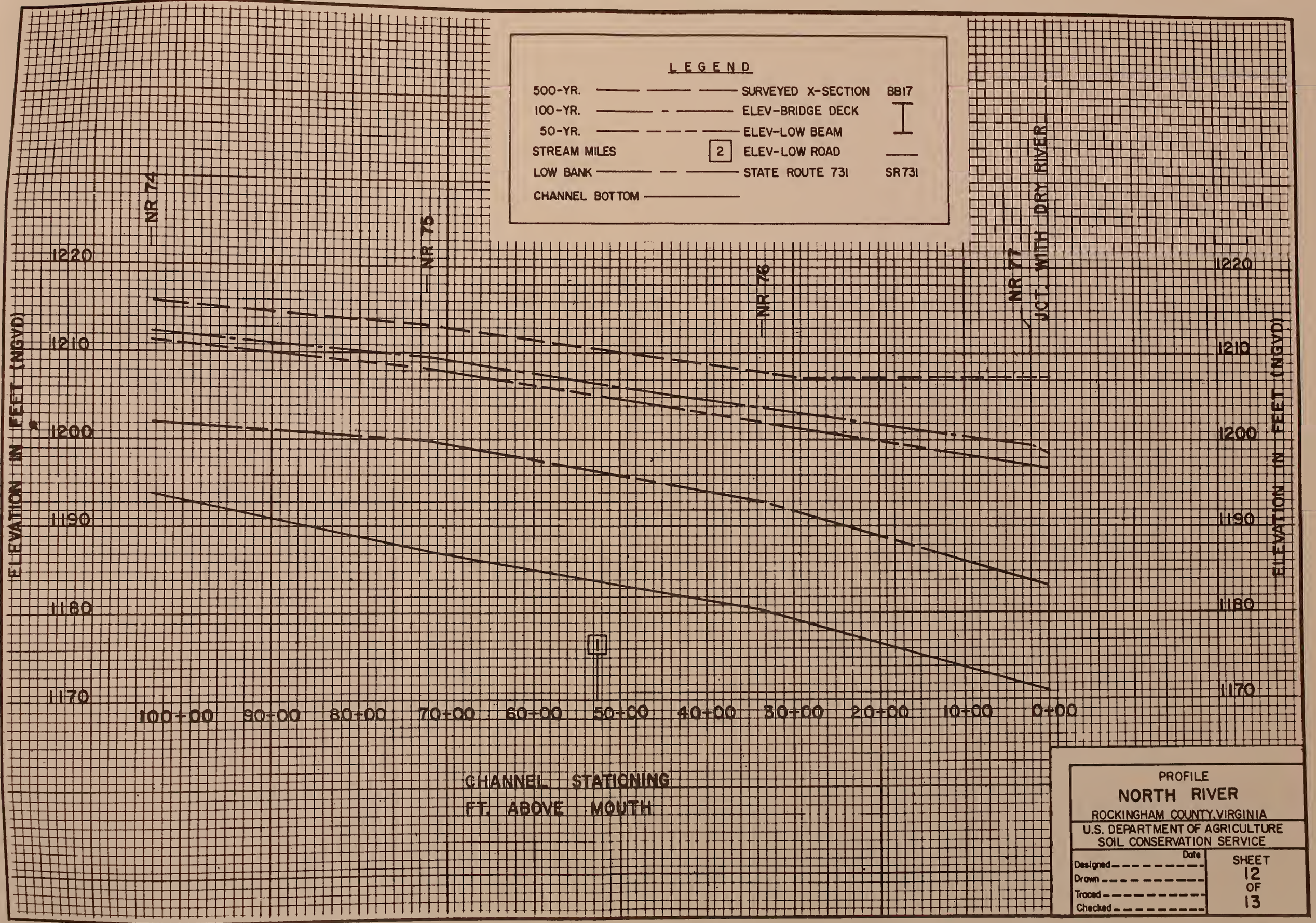
[4] [3] [2]

210+00 200+00 190+00 180+00 170+00 160+00 150+00 140+00 130+00 120+00 110+00 100+00

CHANNEL STATIONING
FT. ABOVE MOUTH

PROFILE
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	11
Drawn	OF
Traced	13
Checked	


LEGEND
500-YR.
100-YR.
50-YR.
STREAM MILES
LOW BANK
CHANNEL BOTTOM
SURVEYED X-SECTION
ELEV-BRIDGE DECK
ELEV-LOW BEAM
2
ELEV-LOW ROAD
STATE ROUTE 731
BB17
SR731
NR 74
NR 75
NR 76
NR 77
JCT. WITH DRY RIVER
1220
1210
1200
1190
1180
1170
ELEVATION IN FEET (NGVD)
100+00
90+00
80+00
70+00
60+00
50+00
40+00
30+00
20+00
10+00
0+00
CHANNEL STATIONING
FT. ABOVE MOUTH
PROFILE
NORTH RIVER
ROCKINGHAM COUNTY, VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
Designed
Drawn
Traced
Checked
SHEET
12
OF
13

LEGEND

500-YR.	SURVEYED X-SECTION	BB17
100-YR.	ELEV-BRIDGE DECK	I
50-YR.	ELEV-LOW BEAM	
STREAM MILES	[2] ELEV-LOW ROAD	
LOW BANK	STATE ROUTE 731	SR731
CHANNEL BOTTOM		

AUGUSTA COUNTY

UPPER LIMIT OF STUDY

MC 92

MC 93A

SR 747

MC 95B

MC 96

MC 97A

SR 727

JCT. NORTH RIVER

ELEVATION IN FEET (NGVD)

240

230

220

210

200

10+00 0+00

2 1

110+00 100+00 90+00 80+00 70+00 60+00 50+00 40+00 30+00 20+00

CHANNEL STATIONING
FT. ABOVE MOUTH

PROFILE
MOSSY CREEK
ROCKINGHAM COUNTY, VIRGINIA

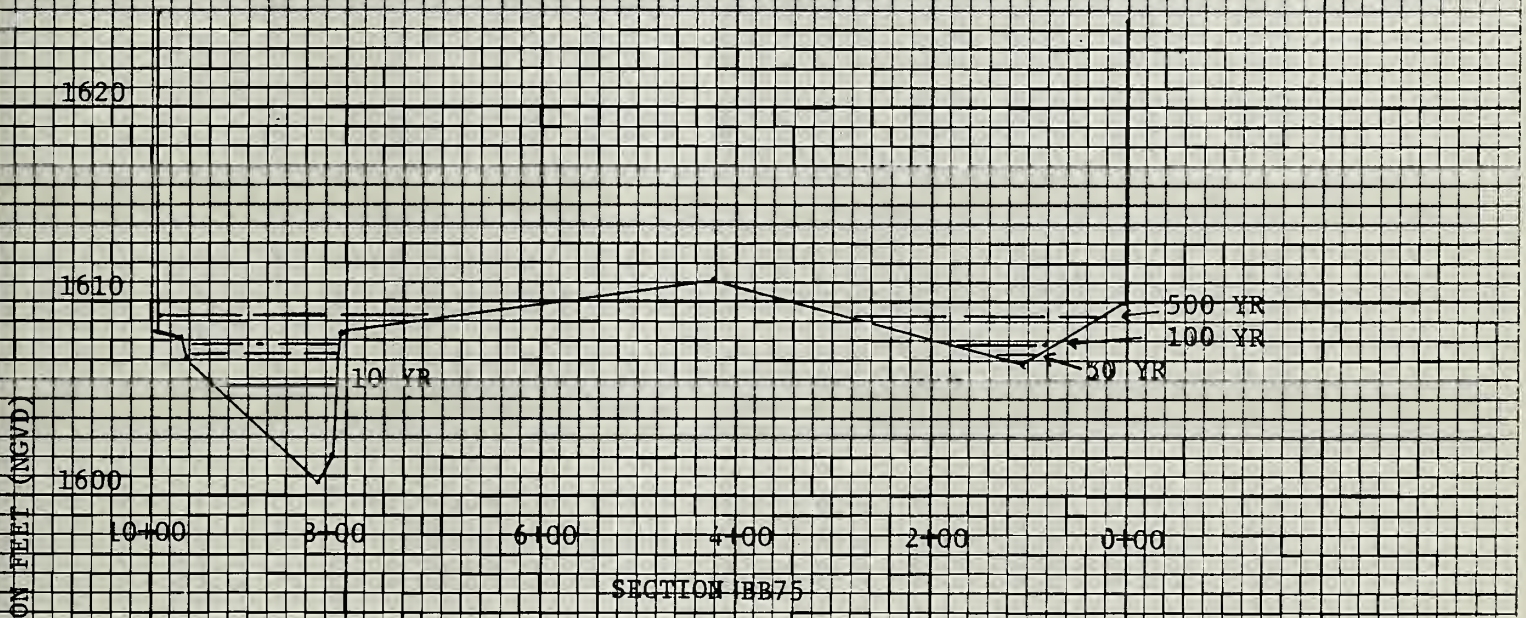
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	SHEET
Designed	13
Drawn	OF
Traced	13
Checked	

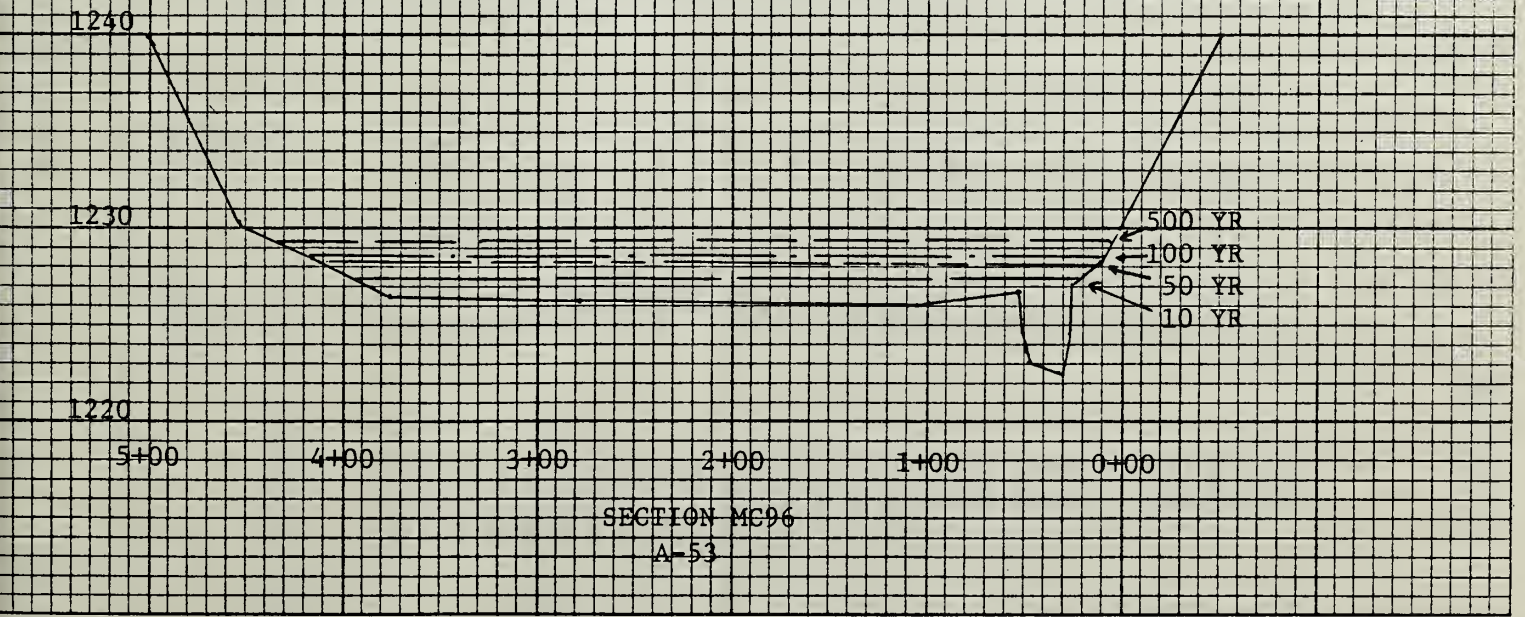
TYPICAL CROSS SECTIONS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date
Designed	
Drawn	
Traced	
Checked	



SECTION BB75



SECTION MC96

A-53

Table A-1 Frequency-discharge-elevations at cross sections on Briery Branch
Rockingham County, Virginia

X-Sec.	Station	Photo Map No.	Profile Sheet No.	DA (sq mi)	10-year Disch. (cfs)	10-year Elev. (ft)	25-year Disch. (cfs)	25-year Elev. (ft)	50-year Disch. (cfs)	50-year Elev. (ft)	100-year Disch. (cfs)	100-year Elev. (ft)	500-year Disch. (cfs)	500-year Elev. (ft)
				Briery Branch upper limit of study										
BB74	380+71	1	1	27.16	1500	1641.9	2300	1643.0	2900	1643.8	3600	1644.6	5500	1646.2
BB75	355+21	2	1&2	29.49	1500	1605.7	2300	1606.6	2900	1607.3	3600	1607.9	5500	1609.1
BB76	303+61	2	2&3	30.63	1500	1542.7	2200	1543.4	2800	1543.9	3500	1544.2	5400	1544.8
BB77	283+81	2	3	31.10	1500	1507.3	2200	1507.7	2800	1508.0	3500	1508.2	5400	1508.8
BB78A	268+21	3	3	31.22	1500	1489.5	2200	1490.4	2800	1490.8	3500	1491.1	5400	1491.4
	266+66	State Route 731 and 257		Low Road 1489.7			Low Steel 1490.8				Bridge Deck 1492.0			
BB80B	265+61	3	3&4	31.25	1500	1485.9	2200	1486.6	2800	1487.0	3500	1487.4	5400	1488.1
BB81	229+66	3	4	31.83	1500	1436.4	2200	1436.8	2800	1437.0	3500	1437.2	5400	1437.5
BB82A	201+76	4	4&5	32.00	1500	1406.0	2200	1406.8	2800	1407.3	3500	1407.7	5400	1408.4
	198+96	State Route 755		Low Road 1402.6			Low Steel 1401.6				Bridge Deck 1402.7			
BB84B	196+36	4	5	32.01	1500	1399.5	2200	1400.0	2800	1400.6	3500	1400.9	5400	1401.7
BB85	172+38	4	5	33.35	1400	1374.6	2100	1375.3	2700	1375.6	3400	1376.0	5200	1376.5
BB86	144+26	5	5&6	33.82	1400	1343.8	2100	1344.5	2700	1344.9	3400	1345.3	5200	1345.9
BB87	125+51	5	6	34.10	1400	1316.9	2100	1317.3	2700	1317.6	3400	1317.8	5200	1318.1
BB88A	107+28	5	6	34.28	1400	1304.1	2100	1304.8	2700	1305.3	3400	1305.7	5200	1306.4
	106+24	State Route 613		Low Road 1311.5			Low Steel 1307.9				Bridge Deck 1311.9			
BB90B	105+20	5	6	34.31	1400	1302.9	2100	1303.5	2700	1303.9	3400	1304.2	5200	1304.7
BB91	94+78	5	6&7	34.40	1400	1290.7	2100	1291.0	2700	1291.2	3400	1291.4	5200	1291.8
	70+82	Beaver Creek												
BB92	66+13	6	7	48.55	2500	1268.5	3700	1269.1	4700	1269.6	5900	1269.9	9000	1270.7
BB93A	59+88	6	7	48.59	2500	1264.4	3700	1265.1	4700	1265.5	5900	1265.9	9000	1266.6
	58+84	State Route 752		Low Road 1261.2			Low Steel 1267.1				Bridge Deck 1268.1			
BB95B	57+80	6	7	48.61	2500	1262.4	3700	1263.0	4700	1263.3	5900	1263.7	9000	1264.3
BB96	33+32	6	7&8	48.82	2500	1247.5	3700	1247.9	4700	1248.0	5900	1248.1	9000	1248.5
BB97A	12+49	6	8	50.70	2500	1231.8	3700	1232.6	4700	1233.0	5900	1233.4	9000	1234.1
	11+45	State Route 748		Low Road 1229.3			Low Steel 1228.3				Bridge Deck 1229.2			
BB99B	10+41	6	8	50.71	2500	1230.5	3700	1231.3	4700	1231.6	5900	1232.0	9000	1232.8
BB100	1+04	7	8	50.82	2500	1224.8	3700	1225.7	4700	1226.5	5900	1227.0	9000	1228.8

Table A-1 Frequency-discharge-elevations at cross sections on North River
Rockingham County, Virginia

X-Sec.	Station	Photo Map No.	Profile Sheet No.	DA (sq mi)	10-year Disch. (cfs)	10-year Elev. (ft)	25-year Disch. (cfs)	25-year Elev. (ft)	50-year Disch. (cfs)	50-year Elev. (ft)	100-year Disch. (cfs)	100-year Elev. (ft)	500-year Disch. (cfs)	500-year Elev. (ft)
				Briery Branch upper limit of study										
NR62	353+50	10	9	101.24	5300	1274.9	7700	1275.4	9700	1275.8	12600	1276.2	21200	1277.1
NR63	318+60	10	9	101.57	5300	1266.1	7900	1267.1	10000	1267.5	12700	1268.0	21200	1268.9
NR64	285+10	10	9	102.50	5400	1255.7	7900	1256.3	10100	1256.7	12800	1257.1	21400	1257.9
NR65	249+50	9	9&10	104.95	5500	1243.3	8200	1244.0	10400	1244.3	13200	1244.8	22000	1245.8
NR66	225+60	9	10	105.64	5600	1234.2	8200	1235.4	10500	1236.2	13300	1237.0	22200	1239.1
NR67A	216+90	9	10	105.65	5600	1233.1	8200	1234.3	10500	1235.1	13300	1235.9	22200	1237.8
	216+00	State Route 613		Low Road	1235.9		Low Steel	1239.2			Bridge Deck	1242.7		
NR69B	215+00	9	10&11	105.68	5600	1232.5	8200	1233.6	10500	1234.5	13300	1235.2	22200	1236.9
	180+50	Briery Branch												
NR70	175+40	7	11	158.76	9400	1223.8	13800	1224.6	17600	1225.2	22300	1225.9	34800	1227.7
NR71	170+70	7	11	158.79	9400	1222.6	13800	1223.4	17600	1224.1	22300	1224.8	34800	1226.7
NR72	159+10	7	11	158.90	9400	1219.6	13800	1220.6	17600	1221.4	22300	1222.2	34800	1224.3
	146+50	Mossy Creek												
NR73	137+20	7	11	175.65	10600	1215.2	15700	1216.9	19900	1218.1	25300	1219.3	39500	1222.0
NR74	103+50	7	11&12	175.94	10700	1208.5	15700	1210.1	20000	1211.5	25400	1212.8	39600	1215.9
NR75	72+30	8	12	176.44	10700	1204.8	15800	1206.9	20100	1208.4	25500	1209.8	39800	1213.3
NR76	33+50	8	12	178.97	10900	1197.9	16100	1200.4	20500	1202.1	25900	1203.9	40400	1208.0
NR77	2+00	8	12	179.24	10900	1192.7	16100	1195.5	20500	1197.4	26000	1199.6	40600	1207.4

Table A-1

Frequency-discharge-elevations at cross sections on Mossy Creek
Rockingham County, Virginia

X-Sec.	Station	Photo Map No.	Profile Sheet No.	DA (sq mi)	10-year Disch. (cfs)	10-year Elev. (ft)	25-year Disch. (cfs)	25-year Elev. (ft)	50-year Disch. (cfs)	50-year Elev. (ft)	100-year Disch. (cfs)	100-year Elev. (ft)	500-year Disch. (cfs)	500-year Elev. (ft)
				Briery Branch upper limit of study										
MC92	105+65	11	13	15.15	660	1234.1	1000	1234.5	1300	1235.0	1700	1235.4	2700	1236.3
MC93A	68+15	11	13	15.51	660	1230.0	1000	1230.5	1300	1231.0	1700	1231.4	2700	1232.5
	67+10	State Route 747		Low Road 1228.4		Top culvert under road level 1229.4					Road level 1230.2			
MC95B	66+05	11	13	15.52	660	1229.5	1000	1230.1	1300	1230.5	1700	1230.9	2700	1231.8
MC96	54+60	11	13	15.84	700	1227.3	1100	1227.7	1400	1228.1	1800	1228.5	2800	1229.2
MC97A	18+65	7	13	16.22	700	1219.0	1100	1219.8	1400	1220.3	1800	1220.9	2800	1223.0
	17+60	State Route 727		Low Road 1221.6		Low Steel 1220.8		Bridge deck 1222.8						

Table A-2 Reference Mark Descriptions and Elevations
North River

B.M. No.	Photo Map No.		Description, Location and Elevation in Feet (NGVD)
109	8	SCS	TBM - A square is chiseled on the southeast concrete abutment of a low water bridge over Dry River approximately 50 feet above the junction of Dry River and North River. Elev. - 1181.82
112	8	SCS	TBM - Approximately 1.8 miles above the junction with North River and Dry River a square is chiseled on the down stream east corner of the abutment of a low water bridge over North River leading to the Harry Showalter farm. Elev. - 1192.91
102	7	USG&CS	BM - Located 1.8 miles northwest along State Route 727 from Bridgewater and 0.3 miles east of the junction of State Routes 747 and 727 at Mossy Creek, 70 feet southwest of a two story dwelling, 15 feet southwest of a double door garage, and 3 feet west of a fence corner. A standard disk stamped "U-102-1935" is set in the top of a concrete post. Elev. - 1234.87
12	9	SCS	TBM - A square is chiseled on the upstream southwest corner of a bridge over North River on State Route 613 and 727. Elev. - 1243.44
75	7	SCS	TBM - A square is chiseled on the downstream east abutment of bridge over Mossy Creek, on State Route 727 west of the junction with State Route 747. Elev. - 1222.70
2000	10	SCS	TBM - A square is chiseled on the upstream south corner of concrete base of swinging foot bridge over North River approximately 250 feet from the centerline of State Route 766, square is located on the west end of foot bridge. Elev. - 1279.86

Table A-2 Reference Mark Descriptions and Elevations
North River

B.M. No.	Photo Map No.		Description, Location and Elevation in Feet (NGVD)
			BRIERY BRANCH
1000	6	SCS	TBM - A square is chiseled in the reinforcement wall on the downstream side of bridge approximately 20 feet from the south west end of bridge over Briery Branch on State Route 748. Elev - 1228.92
1001	5	SCS	TBM - A square is chiseled on the upstream north west abutment of bridge over Briery Branch on State Route 613. Elev. - 1311.96
73	4	SCS	TBM - A square is chiseled on the downstream east corner of pier under wooden floor of bridge over Briery Branch on State Route 755. Elev. - 1402.72
			MOSSY CREEK (Augusta County)
77	11	SCS	TBM - One thousand feet north of the Rockingham Augusta County line, a square is chiseled on the southeast corner of a concrete culvert and cattle under pass on State Route 747 northwest of Arlie Wine dwelling. Elev. - 1256.77

TECHNICAL PROCEDURES

Approximately 16 miles of differential levels to establish vertical control and 50 cross sections were surveyed for this study. Surveys are referenced to National Geodetic Vertical Datum (NGVD) of 1929. Reference mark Descriptions and Elevations are listed in Table A-2 and shown on appropriate photomaps.

The peak discharge-frequency relations of stream gages in the vicinity were determined by the U. S. Geological Survey office in Richmond, Virginia, using a log-Pearson Type III analysis (per Water Resources Council Bulletin 17B, Ref. 12). These discharges were correlated with TR 20 routings (Ref. 13) within the watersheds and used to determine peak discharge-frequency relations for the surveyed cross sections. The resultant data agrees with observed high water marks along North River, Briery Branch and Mossy Creek.

Analyses of the hydraulic characteristics of streams were carried out using the SCS computer program WSP-2 (Ref. 14). Cross section data for the streams and structural geometry of bridges and culverts were obtained by transit surveys. From stage-discharge curves, elevations and flood boundaries could be determined at the cross sections. Straight line interpolations of the elevations were used for flood profiles between cross sections. Flood boundaries between cross sections were drawn on topographic maps using contour lines as a guide. These lines were transposed to the photomaps and checked in the field.

The decrease in discharge from cross section BB74 through cross section BB91 can be explained by having increased storage capacity and decreased local inflow within a wide flood plain reach and a narrow watershed boundary. (See Table A-1) Another contributing factor is the reservoir storage of the Hone Quarry and Briery Branch structures upstream.

Glossary of Terms

backwater. High water caused by downstream obstruction or restriction, or by high stage on an intersecting stream.

BM. Benchmark of established elevation.

cfs. Cubic feet per second - a unit of discharge that is equal to the flow of one cubic foot per second past a given point.

cross section. Shape and dimensions of a channel and valley perpendicular to the line of flow.

elev.-bridge deck. Elevation of a roadway across a bridge or culvert.

elev. - low beam. Elevation of lowest structural "beam" that limits the height of the bridge opening; or may indicate the top of a culvert opening.

elev. - low road. Elevation of low point on a roadway approaching or crossing a bridge or culvert - shown only if lower than elev.- bridge deck at a particular road section.

flood. An overflow of lands not normally covered by water; a temporary increase in streamflow or stage; or the discharge causing the overflow or temporary increase.

flood frequency. An expression of how often a flood of given magnitude can be expected.

10-year frequency flood. The flood which can be expected or exceeded on an average once in 10 years; or which would have a 10 percent chance of being equalled or exceeded in any given year.

100-year frequency flood. ....one percent chance....in any given year.

flood peak or peak discharge. Highest discharge attained during a flood.

flood plain or flood prone area. Lands adjoining a stream (or other body of water) which has been or may be covered with water.

flood profile or profile. A plotted or imaginary line defining the highest water surface elevations along a stream during a particular flood.

flood prone area. See flood plain.

flood routing.	Computation of the changes in the rise and fall in streamflow as a flood moves downstream. The results provide hydrographs of discharge versus time at given points on the stream.
floodway.	The portion of the stream channel and flood plain that must be kept free of encroachment to prevent flood stages more than 1 foot higher than natural conditions.
frequency-discharge curve.	A plotted line showing the recurrence interval (or flood frequency) of discharges at a stream gage, surveyed cross section, or other station along stream. (Used with a stage- discharge curve to determine the high water elevations resulting from selected flood discharges at that station on the stream.)
hydrograph.	A curve showing the rise and fall of flood discharge with respect to time at a specific station on the stream.
land use.	Classification of type of vegetation or other surface cover conditions on a watershed - used (with a similar classification of soils) to indicate the rate and volume of flood runoff.
NGVD.	National Geodetic Vertical Datum of 1929.
peak discharge or flood peak.	The highest rate of runoff (discharge) attained during a flood.
profile.	See flood profile.
runoff.	That portion of the total storm rainfall flowing across the ground or other surface and contributing to the flood discharge.
stage-discharge curve.	A plotted curve showing elevations resulting from a range of discharges at a surveyed cross section, stream gage, or other point on a stream.
TBM.	Temporary benchmark.
watershed.	A drainage area which collects and transmits runoff to the outlet of the drainage basin.

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AFTERWORD

This flood plain management study is an aid to persons living in flood prone areas. If your home is within the flood plain, the following information should serve as a guide for dealing with floods.

Being well informed is your best protection. It is extremely important to know where to go in the event of a flood. Remember that roads are often built in valleys where floodwaters will most likely go. You should reach higher ground, and it may be easier and safer to do this on foot, rather than by car.

The major causes of floods are melting snows and rainfall. Listen to weather reports and be aware of the chance of flooding. Never ignore a flood warning. Listen for emergency instructions and follow instructions given.

If it is necessary for you to evacuate your home, do so quickly and cautiously. Follow evacuation instructions that are given. Do not try to take all of your belongings with you. Take necessary personal items such as eyeglasses or medicines, flashlights, a small supply of canned food, a can opener, and several blankets.

If you are traveling by car you may encounter these hazards:

- washed-out road or bridge
- undermined roadway
- landslides
- fallen rocks
- downed powerlines
- floating debris

Watch for these hazards carefully.

If it is not necessary to evacuate your home, there are precautions you should proceed with.

Fill large containers with water and after doing so shut off the main water valve to protect the clean water already in your water system. Be certain to shut off your water heater since no water will be going to it.

As long as electric service is available it may be used safely unless the main circuits are flooded. In such a case you will reduce the risk of electrical shock and short circuits if you turn the power off. Do not touch the switch if you are wet or standing in water. Unless you detect a gas leak, you may continue to use gas systems.

Be aware that floods often produce fire hazards. Watch for broken or leaking gas or oil lines, flooded electrical circuits, flooded furnaces and other appliances, and inflammable or explosive materials which may come from upstream.

Anchor or move inside any belongings such as trash cans, toys, lawnmowers, etc. They may become hazards to people downstream if they are washed away.

Move livestock to high, open ground and if possible keep them from drinking floodwater or eating feed soaked with floodwater.

The following items could help improve your chances of survival if a flood occurs:

portable radio and spare batteries
first aid kit
flashlights and spare batteries
foods which require little or no cooking and no refrigeration
blankets
rope
hand tools
drinking water

Precautions taken to reduce losses from flooding are called floodproofing.

The basement walls of your home are probably not built to withstand the additional pressures of water-soaked soils. You will have less damage if you allow flood waters to come in. When you receive a flood warning, remove articles from basement and open a basement window. Fuse boxes and other equipment should not be located in the basement.

Floodproofing for homes with adequately reinforced basement walls could include: sealing cracks in walls and floors with hydraulic cement, installation of a sump pump with a reliable power source, placing heavy screens over windows to prevent breakage from floating objects, and placing valves on main drain lines to prevent backup of water.

It is important to remember that floodproofing can help reduce damages, it does not make it safe to remain in your home during a flood.

After a flood, reenter buildings with caution. Watch for fire hazards and falling debris. Do not use appliances until they have been checked for damage. Do not use any food or water which may be contaminated.

Normal home insurance does not cover flooding. Ask your insurance agent about federally subsidized flood insurance. Not all agents handle flood insurance and you may have to contact several of them.

Many people are hurt or killed during or after a flood by their own carelessness. Know before hand what to do if a flood occurs. Your local Civil Defense Agency can help you with any questions you may have.